POLYETHYLENE FILM

Some things you should know about this versatile plastic material that serves a multitude of uses in concrete construction

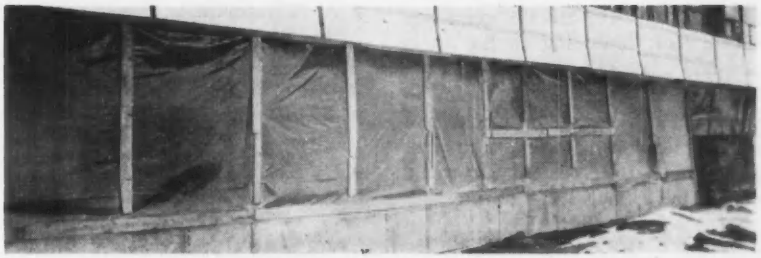
CONCRETE, one of the oldest man-made materials of construction, is rating some notable assistance these days from a new family of man-made materials called polyethylene films. They're still relatively new, but their importance in many branches of concrete construction work is growing by leaps and bounds, and their future in this field seems assured.

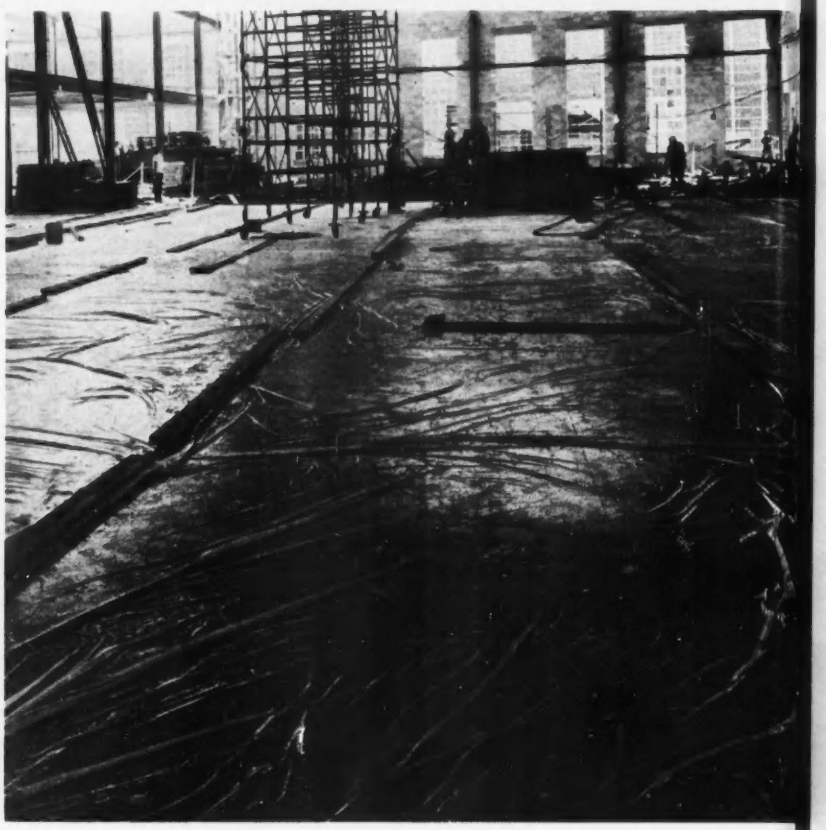
Polyethylene film is a somewhat confusing material because it is a member of that exceedingly confusing family of materials called plastics. Part of the confusion arises because most plastics aren't plastic at all at ordinary temperatures, and nearly half of them can never be made plastic once they have set.

The plastics in general are more truly man-made than any other materials in common use today. The complex polymers from which they are formed are very large molecules which link and cross-link such common elements as carbon, hydrogen, nitrogen, oxygen and chlorine. By linking these elements together in varying patterns, it is possible to form plastics which are resilient or rigid, inflammable or fireproof, transparent or opaque, soft or hard.

In the sense that it remains pliable at ordinary temperatures, polyethylene

Polyethylene film shields interior of building in cold-weather construction.





Used for curing concrete, a covering of polyethylene film keeps the moisture from evaporating too rapidly.

is a true plastic, and it is this characteristic, as well as some others, that has led to its rapid application to certain problems in the construction field. It is unaffected by most acids, alkalies, bacteria and molds. So-called polyethylene film is entirely flexible and conforms easily to most desired shapes. Once it is in place it will not break, tear, puncture, or deteriorate under ordinary conditions. It has a very low vapor transmission rate, but it permits the passage of oxygen and carbon dioxide.

The principal characteristics of polyethylene film remain virtually unchanged from 70 degrees below zero to 160 degrees above. It is light in weight and correspondingly easy to handle; 1,000 square feet of 4-mil film weighs less than 20 pounds. And finally it is a relatively cheap material, ranging from 1½ to 3½ cents per square foot, depending on the thickness and quantity purchased.

The uses of polyethylene film in construction work are manifold, and new applications are coming to light at a rapid rate. A partial list would necessarily include the following:

- As a vapor barrier material in slab-on-ground, full cellar, or crawl space construction;
- As a vapor barrier, wind barrier and dust barrier in many types of wall construction to prevent condensation, cracking and peeling of paint, and other moisture-induced troubles;
- As a membrane curing material in concrete slab and tilt-up construction;
- As a bond breaker or parting agent for separating tilt-up panels from base slabs;
- As a low-cost replacement for conventional forming materials in pouring concrete roofs.
- As a form-lining material, when backed up with paper, to give a glass-like finish by preventing the hardening concrete from conforming to the wood grain;
- Used as a loose lining material in basement or foundation wall forms, polyethylene film adheres to the concrete when forms are removed to provide a permanent water barrier;
- As a surface dust and dampproofing material applied over concrete floor slabs before installing block and strip flooring on screeds;
- As a covering for concrete both during and after curing to protect it from construction debris, mortar, staining, and abrasion from contact with men, materials or equipment;
- As a temporary enclosure to protect concrete work or other construction from wind, rain, hail, snow or freezing temperatures;
- As a temporary glazing material during construction;
- As a flashing material for use around doors and windows;
- As a protective covering for equipment and materials stored in the open.

The following four pages illustrate and describe special applications of polyethylene film to the field of concrete construction.

Let us discuss now in a little more detail some of the uses of polyethylene film which apply particularly to the field of concrete construction.

Curing. Of all the varied uses listed above, one of the most important so far as concrete men are concerned is in curing. The importance of polyethylene film as a membrane curing material is a direct result of its high resistance to the passage of moisture.

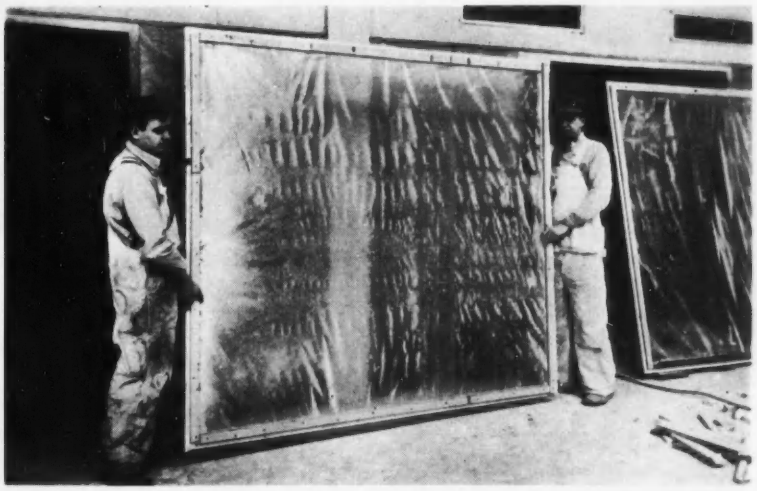
There are two basic methods of properly curing concrete: retaining the original moisture or replacing it as it is removed. The obvious danger of the second method is that the concrete may be allowed to dry out before the water is replaced, thus arresting or retarding the hydration process through which concrete gains strength.

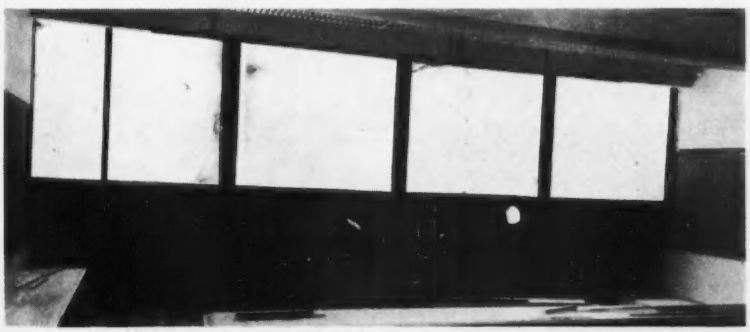
Since proper curing not only results in stronger concrete, but has a favorable effect upon such characteristics as durability, water-tightness, dusting and surface wear, there is a growing preference for methods which provide for the retention of moisture rather than for replacement. Polyethylene film appears to be well suited to this job.

It is easy to handle and comes in rolls of considerable width (up to 32 feet) to facilitate covering large areas of concrete. It is tough enough to withstand any ordinary roughness in handling, and yet light enough so that two men can quickly and efficiently cover almost any slab area. It can be salvaged and made ready for reuse by simply rolling it up and storing it for the next job.

Film placed under concrete floor permanently keeps out ground moisture.

Translucent film stapled into large wooden frames transmits so much daylight that men continue work on interior of building without artificial lighting.





When used for curing, polyethylene film should be placed as soon as the concrete is hard enough to resist marring of the surface. The surface may be sprinkled lightly before covering it with the film. It is desirable to allow 4 to 6 inches of overlap at the joints. Joints may be sealed with pressure-sensitive tapes or non-staining mastics, or weighted down with planks. Portable electric tools are also available for sealing joints by means of heat and pressure, but this technique is more applicable to permanent film installations for vapor barrier or waterproofing purposes. In curing applications, films should be left in place for three to five days to assure good results.

Vapor Barriers. Tests indicate that the ground area under almost any average building is an invisible spring which may produce as much as 19 gallons of water vapor every 24 hours. Most basic materials of construction, including concrete, do not provide an effective barrier to this moisture, and its gradual passage through floors and walls can cause wood floors to buckle, beams to rust or rot, rugs and furniture to mildew, and even plaster to crumble and fall.

It is to combat this movement of

water vapor that barrier materials are now so widely used in construction.

In vapor barrier applications of polyethylene film for slab-on-ground construction, it is best to lay the material on a bed of sand. There is probably some advantage to closing joints with an electric sealer, but taping and stapling are also acceptable methods. The film should be secured to the sidewall of the foundation with asphalt.

When pipes and electrical conduits must pass through the film, they should be wrapped tightly in small sheets of film and sealed with the main barrier.

In laying reinforcing steel over a polyethylene film vapor barrier, only nominal care is necessary to prevent damage to the film. The material is tough and resilient enough to stand up under the normal abuse to which it is likely to be subjected.

Builders report that a polyethylene barrier can be laid for an average house of 1100 square feet by one man in about an hour and a half. The material for such an application should cost about $15.00. Used as a vapor, dust and draft barrier throughout a modern $20,000 house, polyeth costs the builder around $65.00.

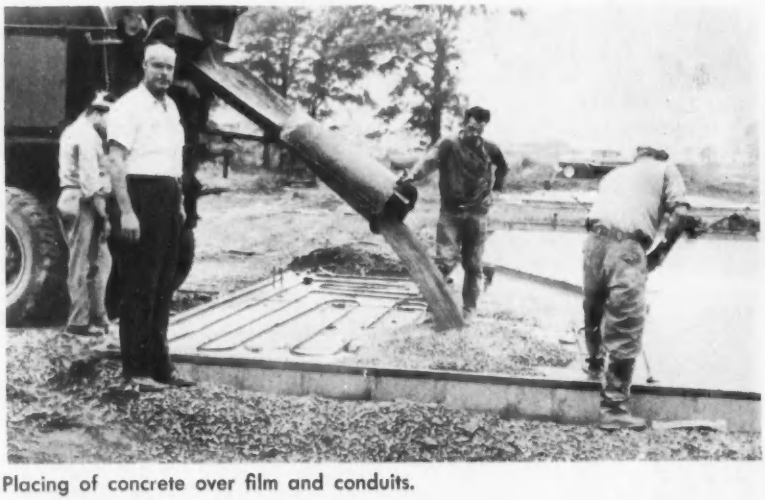
In addition to pure polyethlene films, several paper-supported polyethylene products are now being marketed as vapor barrier materials.

Form Lining. One of the newer developments in the concrete field is the lining of forms with strong paper and tape coated with polyethylene. This technique is said to yield fin-free concrete smooth enough to paint without any special preparation. When the form is stripped the lining material adheres to the concrete and may be left in place as long as desired to extend the curing time. Ultimately the coated tape-and-paper lining is stripped from the concrete although this product is particularly recommended for flat horizontal surfaces, it is also applicable to vertical surfaces.

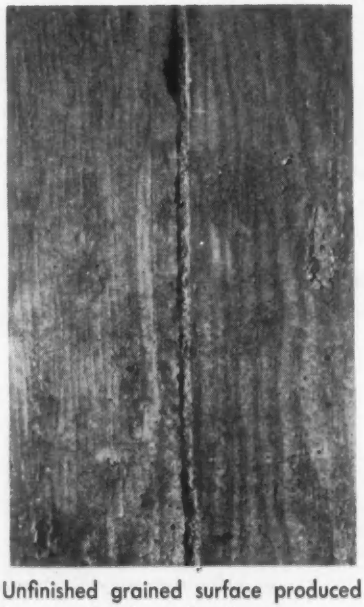
Tilt-Up Construction. Polyethylene film is, of course, well adapted to the problem of curing tilt-up wall panels. It has an additional interesting application in this field as a bond breaker between the wall panel and the base slab on which the pouring is done.

The procedure is quite simple. The base slab is first thoroughly swept and then is flooded with water to enable the film to adhere closely. The film

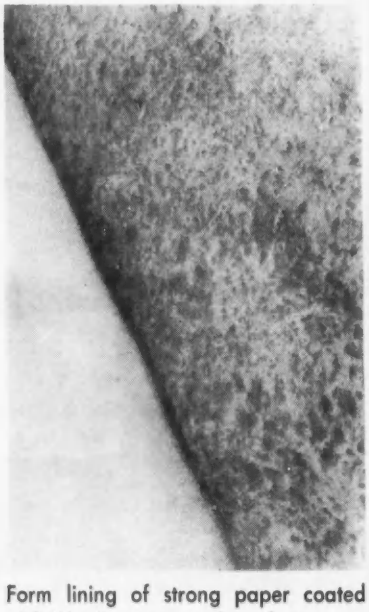
Workers place film vapor barrier over gravel base before pouring concrete.



Placing of concrete over film and conduits.



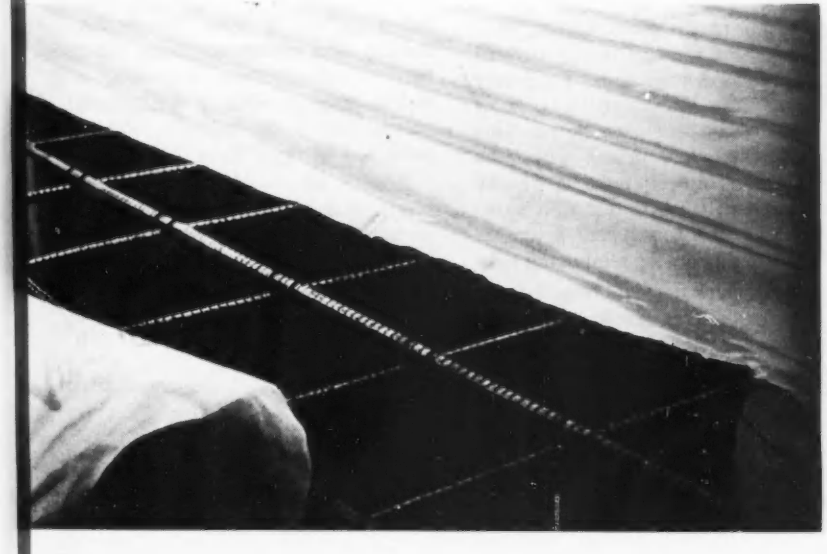
Unfinished grained surface produced by an unlined wooden form.



Form lining of strong paper coated with film leaves smooth surface.

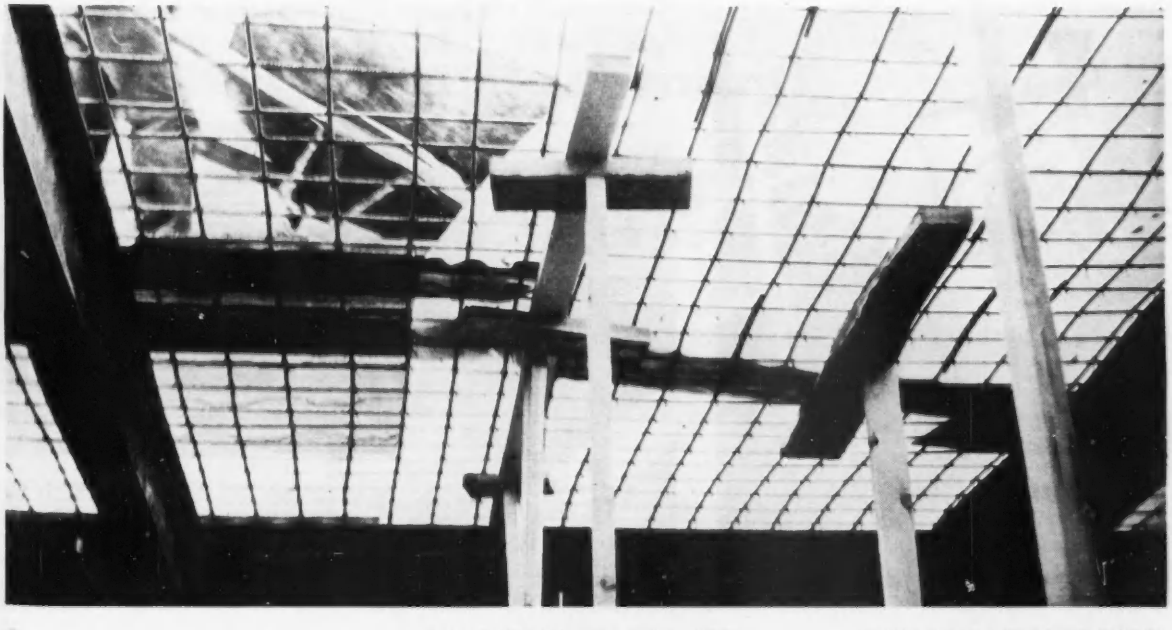
In TILT-UP CONSTRUCTION panels are poured one atop the other, with film used between as a bond breaker. The film serves to separate the tilted panel from the one which is still on the ground.

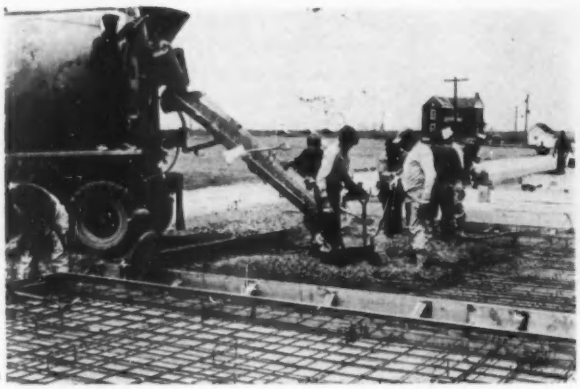
Forms for the concrete wall panels are constructed.



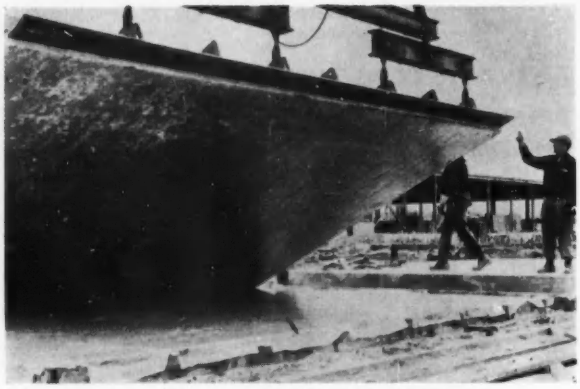
The photo at the left, as well as those across the bottom of pages 6 and 7 show the use of polyethylene film in ROOF-PLACING operations.

Left: film is placed over reinforcing rods. *Below:* following placement of film, temporary planking is laid to enable workmen to wheel concrete where needed.





Concrete is poured into panels, one above the other.



Tilted slab is easily separated from base by film.

is placed and wrinkles are worked out by means of an ordinary pushbroom.

Tilt-up slabs separated from base slabs in this manner are said to break loose easily, quickly and safely, and to have exceptionally smooth, architectural finishes on the "down" surfaces.

Forming. Probably the newest and most revolutionary of the many uses found for polyethylene film in concrete construction work is as a low-cost replacement for conventional forms in roof pouring operations. In this application the film is laid over a network of ⅜-inch reinforcing rods which are supported by strategically placed "I" beams. The rods are spaced about 6 inches apart in both directions, and are tied together to form a mesh.

Six-mil. film is placed directly over the rods, and the film is then covered with standard wire mesh. Temporary shoring helps support the network of steel rods until the concrete has been poured and cured. In one application employing this technique, a 72- by 24-foot roof was poured with structural steel members spaced 8 feet on centers to support the reinforcing rods.

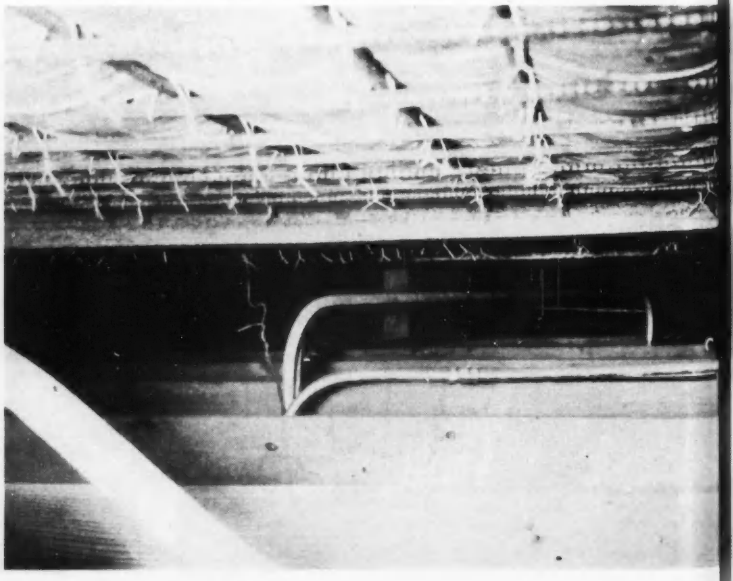
Conclusion. It should be noted that a number of other excellent and effective materials are being widely used in concrete construction work today for most of the purposes we have discussed here in connection with polyethylene films. The polyethylene film applications are covered here as a group because they are comparatively new and relatively little has been published concerning them. Articles discussing other membrane curing, vapor barrier, and enclosure materials, as well as other members of the versatile plastics family of materials, will be published in the months ahead.

Readers who would like to receive specific information concerning some of the proprietary polyethylene films available for use in the construction field are urged to fill out one of the convenient product information cards at the back of this issue. END

Photos through the courtesy of:
THE VISKING CORPORATION
AND BAKELITE COMPANY

Concrete is poured directly on film.

Completed roof and dropped ceiling with dead air space between.



Cramped work space and no place for play have made many a home owner turn away from the utility room and say . . .

Bring Back the Basement!

SINCE WORLD WAR II, Americans have made a fad out of compact living. First, the dining room was eliminated. Then the large, old-fashioned kitchen was reduced and squeezed into an efficient line-up of utilities behind folding doors. Finally, the basement was pulled out from under us—wasted space, they said, and it raised the cost of home building.

But now the pendulum is swinging in the other direction. People are crying for more room. Young couples are marrying earlier and starting their families sooner. More babies are being born. Bigger families need bigger living quarters. They need plenty of room to work and play. The modern utility room, on the same level with the rest of the house, just doesn't fill the bill.

Let's take a look at what's happening to the Jones family in their low, modern, and basementless ranch home. It's Sunday afternoon and it's snowing. Tommy, age 5, and his little brother Tim have a railroad system covering the living room floor. Mother is hanging the wash up to dry in the kitchen. The utility room is already draped from corner to corner with drying clothes. In fact, Dad has to duck under a lineup of wet socks every time he reaches for a tool on the peg-board wall cabinet he calls his "workshop." He has almost drilled his way through a two-inch-thick board when in bumps son number three covered with snow and shedding a pool of water all around him.

Pretty crowded and confused, isn't it? And not so efficient as the all-on-one-level house is supposed to be. More and more families are beginning to find themselves in the fix described above and they're recognizing the need for concrete basements. There is mounting evidence that it is getting tougher to sell a basementless house and that the hypothetical saving just isn't worth the inconvenience and dis-

comfort. In the opinion of home owners and prospective home owners surveyed by six leading magazines covering the housing field, an average of 70 per cent said that they definitely want a basement.

Even the low-cost homes are offering basements. Small homes costing between $10,500 and $11,500 that will be built for rent or sale in a midwestern city all have basements.

In homes at this price level, the cost of construction must be kept down. And yet the builders have apparently recognized the trend and believe that only houses with basements will sell. Maybe they're learning from the experience of another midwestern builder. He constructed a number of new homes, but only two of a half-dozen types provided full basements. The ones with basements sold before they were completed!

The story is the same in other sections of the country. You can count three out of five houses built recently in the Middle Atlantic states that have full or partial basements. In Northeastern states, the count shows that 62 per cent of the houses have full or partial basements; and in the Midwest, including the Northern lake area, 69 per cent of the houses are built with either full or partial basements.

Evidence like this should make the sales-minded contractor think twice before eliminating the basement. In the first place, does it really cut construction costs? You still have to provide some space above ground for a heating system, utility and laundry room, a workshop, and storage facilities. Besides, before you lay the floor for a basementless house, you have to dig pretty deep. You have to dig trenches and pour footings. On top of these footings, you build a wall, 4 to 6 feet high, before you lay your floor joists or pour the floor surface.

So while you're at it, why not scoop out the entire area under the house? Pour a concrete floor, put your walls up, and you have a basement for a few hundred dollars' extra cost.

The home owner can take over from there. He can add a sturdy tile floor and panel the walls to make an attractive and comfortable "extra" home for his family. A finished basement will give them adequate space for work and a pleasant area for hobbies and play. And with families growing the way they are, a rumpus room for children and grandchildren can save

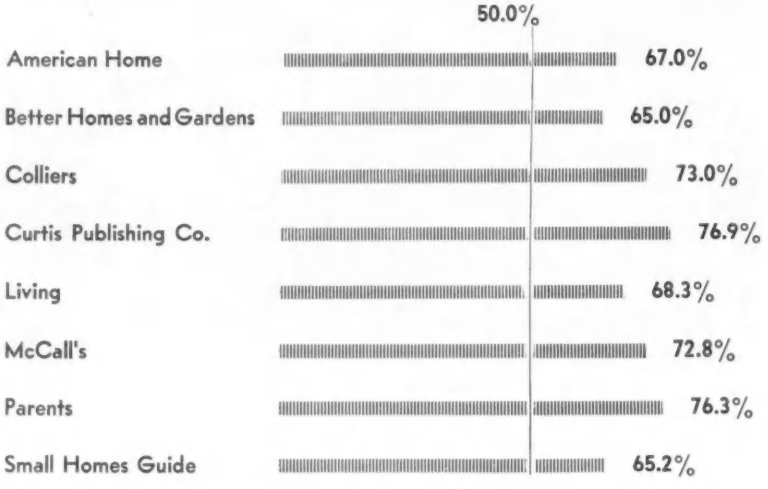


Chart above gives results of a survey by leading national consumer magazines—dramatically demonstrating the overwhelming preference for basements.

a lot of wear and tear on the living room furniture and rug. Off to one corner and out of sight, the basement offers a place for heating system, hot water supply, fuel, and laundry equipment. Mother has a place to wash and dry clothes on cold or rainy days, not to mention a cool retreat for ironing on hot summer days.

Perhaps the greatest blessing of all that the basement offers derives from its old-fashioned predecessor, the cellar. Only a basement can provide the necessary storage space that a family needs. It offers cool storage for canned goods, fruits, and vegetables. It offers a hiding place for trunks, screens, cartons of old books, summer furniture, and old family portraits.

Another blessing—somewhat hidden when the home owner first moves into a house with a basement—is that he has a lot more space for outdoor living. Where the house would otherwise extend over the lot to provide a utility room, he can plant shrubs and flowers and put in a lawn.

Finally, because of home-owner preference, the market value of the house with a concrete basement is higher. It's easier to finance, too. And this can more than offset the slightly higher initial cost of construction.

So the next time the question comes up of whether the basement is "to be or not to be"—you can point out the benefits to the prospective builder. Then start pouring the concrete! END

DIG A HOUSE FOOTING IN THIRTY MINUTES

Photo courtesy of Barber-Greene

This rubber-tire mounted ditching machine is equipped to do the job.

ALL-AROUND FOOTINGS for more than 900 slab-floor houses; a job completed in 11 weeks by one man and one machine: That's the amazing construction record set by a Hastings, Minnesota, firm specializing in this type of work.

To alleviate a critical housing shortage in the prominent steel-mill city of Joliet, Illinois, three giant developments are in process. One consists of 500 dwellings being constructed by St. Louis Construction Company, using National Homes pre-fabs. The other two, totalling 453 units, are being erected by Beck-Utah Company, using pre-cut housing of their own design. There are seven sizes in all, ranging in foundation dimension from 28 feet by 24 feet to 48 feet by 24 feet.

All are of the slab-floor type, requiring all-around foundation footings 8 inches wide. The National Homes plans call for these foundations to extend 36 inches below ground level and the Beck-Utah units, 42½ inches.

As a cost-saving factor, it was decided to have the footings cut exactly to the desired depth and width, if possible, with square corners and vertical walls, so that the concrete could be poured with forms of any kind.

After several types of equipment were investigated and tested, the contract for all of the projects was let to the Hunter Construction Company of Hastings, Minnesota. Hunter selected a rubber-tire mounted ditching machine for the job. The machine had several advantages. First, its vertical boom made it possible to dig trenches with vertical walls and square ends, leaving none of the digging to be done by hand. It is designed for one-man operation and can travel from job to job on its own rubber, making a trailer unnecessary. As a result of this, Hunter has been able to keep his crew requirements to one man . . . himself . . . with an occasional assist from a man provided by the prime contractors.

Digging conditions on the three

projects have covered a wide range. In one, nothing but easy cutting loam was encountered, while on another, located adjacent to some worked-out quarries, a high percentage of rock was encountered. The machine shown in the accompanying photographs is equipped with a fluid coupling and a hydraulic drive which gives it an infinite range of digging speeds from zero to 16 feet per minute. The forward speed of the machine, while digging, is controlled by a single hydraulic valve which enables the operator to maintain very sensitive control, and to stop or reverse with minimum delay. The same system provides overload protection when an immoveable underground obstruction is encountered, and its instant response to the operating controls makes it possible to work within a tolerance of one inch on the length of each cut.

As soon as the earth-moving machines have cleared and compacted an area, usually one or two blocks long, the excavator moves in and begins the footing excavation. Disdaining the conventional stakes and string-line, he lays out carefully measured dimensions right on the ground, using a heavy stripe of blue carpenter's chalk. These marks provide guide lines for the drive wheel on the operator's side and are laid out to compensate for the distance between the wheel and the digging boom.

As soon as the first cut has been made, the boom is raised, the machine moves to a new position and begins a second cut at right angles starting at the end of the first cut. This procedure is repeated for the third and fourth cuts. The end of the fourth cut coincides with the beginning of the first to complete the rectangle. The machine then moves on to the next footings.

Digging time for each set of footings is generally half-an-hour and even under the most adverse conditions does not exceed one hour. This is evidenced by Hunter's schedule which calls for finishing 15 to 20 units daily.

Soon after the footings have been dug, they are filled to ground level with concrete from transit-mix trucks. Reinforcing bars are inserted before the pour and remain above ground level, to bond the footings to the 9-inch concrete curb which is then formed and poured above ground level.

As soon as the curb has been set, plumbers and other workmen move in to install all of the utilities, the heating ducts, the sewer and water connections, in the area inside the curb. When completed, a 5-inch layer of pea gravel is shoveled in and leveled, then covered with a 4-inch concrete slab. This completes the floor and leaves all of the utilities protruding, ready for connections.

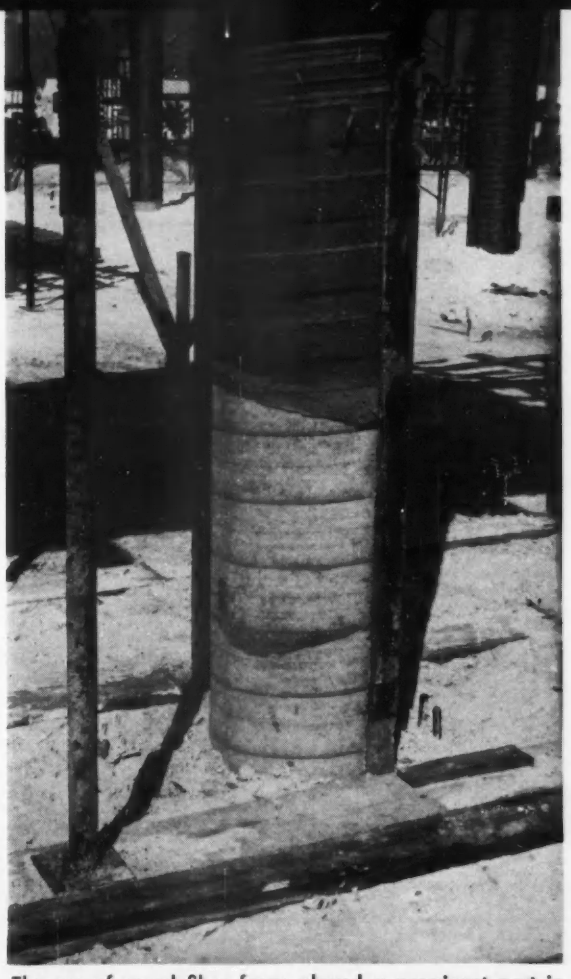
Encouraged by the speed and success with which this job has been completed, and spurred by the satisfaction expressed by the prime contractors, Hunter Construction Company intends to continue their specialization in the footings field. Other contracts in the offing involve as many as 2,500 units in a single project. END

Working down the final leg of the foundation, the ditcher will then move to the next job.

Contractors find that smooth, round concrete columns can be obtained with low cost . . .

FIBRE FORMS

BY PORTER V. TAYLOR



The use of round fibre forms played a prominent part in construction of the Sears store at Coral Gables. Here the form is partially stripped, showing finished column.

FOR DEPARTMENT STORES and other construction work where the finished appearance is important, the use of round fibre forms has been found to produce very satisfactory results.

When the architectural firm Weed, Russell and Johnson drew plans for the big Sears Roebuck store at Coral Gables, Florida, these fibre forms were specified because the architects wanted the exposed columns to be round, and they felt that the use of this type form would result in a column more suitable for attractive finishing after stripping. This was considered important because many of the columns were to remain exposed in the shopping areas.

The contractor, Edward M. Fleming, says that cost of using these disposable forms compares favorably with the cost of wood forms; and that in many large warehouses where the appearance is not important, the forms are used and the columns left exposed after stripping.

After completion of the Coral Gables store, Sears Roebuck & Company started work on two more stores, one in West Palm Beach and one in Fort Lauderdale, Florida, and they have specified the round fibre forms for both of these buildings.

Herman Feldman, manager of Construction Products Corporation at Miami, says "Our round fibre forms provide a beautiful space-saving column which has no corners, and which would be prohibitive in cost with the use of wood forms." Mr. Feldman says that they are now selling ten times as many of these forms as they were three or four years ago.

Some of the advantages of the fibre forms include light weight, easy handling, minimum bracing, and easy stripping.

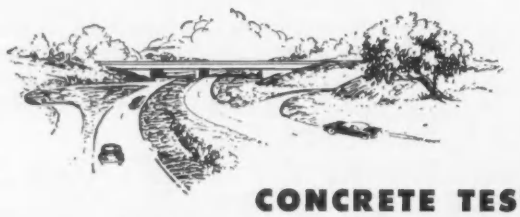
The forms come in any diameter from 1 inch to 36 inches, and may be ordered in special lengths, or may be cut to required length. They may also be tied in with steel or concrete beams, and can be vibrated without suffering damage.

Stripping may be done by slicing a short distance at the top and then unwinding; or an even faster method is to use a portable saw equal in depth to the thickness of the form material, and then pull the forms free.

When finishing is desired, the small ridges left by the forms are usually rubbed off with stone. Then the columns are either painted, plastered, or sometimes they may even be finished with tile. END

Round fibre forms are erected quickly and economically, —here they stand ready for the concrete pour.

The finished product: smooth and perfectly rounded concrete columns that add to store's architectural appeal.



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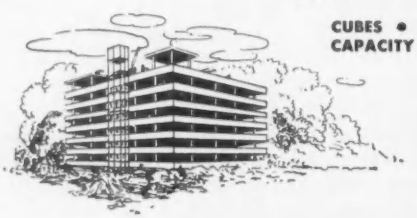

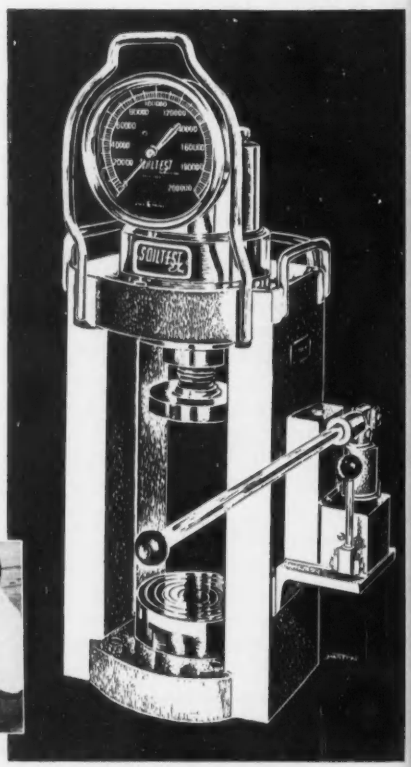

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